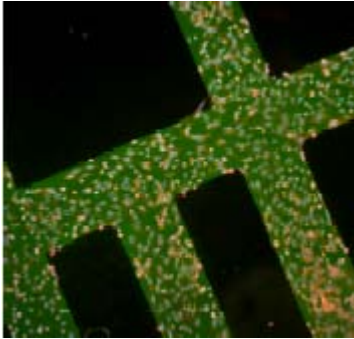


## Telling Cells Where to Go



Among the most important and challenging problems in materials science is the design of biomaterials that can guide – or control – the behavior of cells. This challenge arises in any surgical procedure that involves the implantation of a medical device or the use of materials to effect wound closure (e.g., by polymeric sutures). In normal tissues, much of the responsibility for guiding cellular behavior is assigned to proteins, which are often difficult to process into useful biomaterials and devices. Recently, researchers in the Center for the Science and Engineering of Materials at the California Institute of Technology have introduced a new class of artificial proteins that can be processed by the same methods that are used to turn silicon wafers into computer chips. By engineering the protein synthesis machinery of bacterial cells, the Caltech group has been able to prepare artificial proteins that contain an unusual amino acid that undergoes rapid chemical reactions upon absorption of light. Those chemical reactions crosslink the protein chains to their neighbors, rendering the protein insoluble in regions that have been exposed to light. Because the unexposed regions can be washed away, cells will bind only to the exposed regions. The figure shows a pattern of human endothelial cells (the cells that line blood vessels) prepared by irradiating an artificial protein film through a mask, washing away the soluble parts, and exposing the entire surface to a cell suspension. In the figure, the protein is stained green; the endothelial cells appear to be blue. There is essentially no cell adhesion in surface regions that were not exposed to light. This kind of patterning provides a means of engineering new kinds of devices that combine cells and materials for therapeutic, sensory and diagnostic applications.

### ***CSEM and Caltech-Wide Educational Outreach***

CSEM is a founding member of the Caltech Educational Outreach (CITEO) office. Established by the Caltech faculty board and the Office of the Provost, it is a new resource to the Caltech community. CITEO helps increase public understanding of science, engineering, and new technologies through educational outreach. CITEO facilitates, coordinates, and assesses Caltech's research-based educational outreach programs, provides personal assistance to faculty scholars, students and staff within the Institute's six academic Divisions, and works to coordinate their educational outreach efforts with other groups on campus. Recently, CITEO facilitated the formation of a community based Local Educators' Network (LEN). The LEN provides local educators with a primary role in the design and implementation of Institutewide educational outreach programs. In addition, CITEO identifies and establishes contact with internal and external partners to leverage support, attract additional support, increase visibility and broaden the program's impact.





## ***CSEM and Chemagination***



Chemagination is a science essay and poster contest for high school chemistry students. Students write an article and design a poster that describes an innovation in one of four categories:

Biotechnology, Medicine/Healthcare, New Materials, or Transportation/Environment. The contest challenges students to demonstrate an understanding of chemical principles while allowing them to imagine an invention that will be relevant to people their age twenty-five years in the

future. CSEM in partnership with the Southern California Local Section of the American Chemical Society held the first regional Chemagination competition on the West Coast in October 2003 at the Long Beach Hilton in Long Beach, CA.